

**Before the
Federal Communications Commission
Washington, D.C. 20554**

| | | |
|---|---|----------------------|
| In the Matter of |) | |
| |) | |
| Establishing the Digital Opportunity Data |) | WC Docket No. 19-195 |
| Collection |) | |

COMMENTS OF VERMONT DEPARTMENT OF PUBLIC SERVICE

Sarah L. J. Aceves
Special Counsel
Vermont Department of Public Service
112 State Street
Montpelier, VT 05620
O: 802-828-3167
C: 202-423-3363

September 10, 2021

TABLE OF CONTENTS

Summary.....ii

I. Introduction..... 1

II. Mobile Service Challenge Process 3

a. Network Technology..... 3

b. Voice Coverage Challenges..... 4

c. H3 Geospatial Indexing System..... 5

d. Geographic and Testing Thresholds 5

e. Temporal Threshold..... 7

f. Evaluating challenges against stationary and in-vehicle mobile maps 8

g. Test Location Reporting..... 9

h. Carrier Support 11

III. Conclusion 12

SUMMARY

The Vermont Department of Public Service (“VTDPS”) is pleased to present these initial comments in response to the proposed technical requirements to implement the mobile challenge, verification and crowdsourcing processes required by the Broadband DATA Act. Incorporating challenge data is crucial to ensure accurate mobile broadband availability throughout the United States. It is the hope of VTDPS that these comments, based on our vast experience with testing mobile voice and broadband availability in Vermont, will assist the Commission in establishing the most effective and accurate challenge and verification processes available.

VTDPS recognizes the difficult task in ensuring mobile broadband availability while also ensuring that the challenge process is consumer friendly. However, as currently proposed, the technical requirements lack any substance as they relate to rural areas. Because the vast majority of the country is rural, drive testing must play a much larger role in the challenge process than currently proposed. The proposed technical requirements render drive testing nearing impossible to successfully complete. Further, the proposal to essentially exclude mobile voice service from the data collection process is a risky endeavor that has the potential to relieve mobile service providers from producing quality coverage maps at all.

In order to ensure creation of the most accurate coverage maps, there must be a meaningful challenge process for both stationary and drive testing that tests voice and broadband coverage alike.

**Before the
Federal Communications Commission
Washington, D.C. 20554**

| | | |
|---|---|----------------------|
| In the Matter of |) | |
| |) | |
| Establishing the Digital Opportunity Data |) | WC Docket No. 19-195 |
| Collection |) | |

COMMENTS OF VERMONT DEPARTMENT OF PUBLIC SERVICE

Pursuant to Sections 1.415 and 1.419 of the rules of the Federal Communications Commission (“Commission”), the Vermont Department of Public Service (“VTDPS”) submits these comments in response to the Commission’s July 16, 2021 Public Notice seeking Comment on Technical Requirements for the Mobile Challenge, Verification and Crowdsourcing Processes Required under the Broadband DATA Act (“*Public Notice*”).¹

I. Introduction

VTDPS is a state executive branch agency charged with representing the public interest in planning and advocacy with regard to energy, water and telecommunications matters. In 2018, VTDPS initiated an extensive coverage verification project to document the implausibility of the wireless coverage maps filed with the Commission by major industry carriers. These major carrier maps depicted robust coverage claims that simply did not comport with the reality that too many Vermonters face on a daily basis: spotty coverage, dropped calls and, in wide swaths of the state, no coverage at all. The VTDPS conducted 187,506 mobile speed tests across the state, driving over 6,000 miles of back roads and logging approximately 264 hours.² Through this

¹ Comment Sought on Technical Requirements for the Mobile Challenge, Verification and Crowdsourcing Processes Required under the Broadband Data Act, *Public Notice*, WC Docket No. 19-195 (July 16, 2021) (“*Public Notice*”).

² *Mobile Wireless Drive Test*, Vermont Department of Public Service, available at <https://publicservice.vermont.gov/content/mobile-wireless-drive-test> (last visited September 1, 2021).

exercise, VTDPS gained a detailed understanding of mobile coverage gaps in the state. Based on the data collected, VTDPS estimates that approximately 72% of the state continues to lack reliable mobile broadband service.³

VTDPS' speed test exercise also proved highly instructive for determining what is and is not feasible with regard to coverage data verification and the challenge thereof. Specifically, the methods used to efficiently collect data, generate accurate coverage maps and challenge that asserted coverage must ultimately reflect the enduser experience. This is especially important now, as the COVID-19 pandemic has only exacerbated and underscored the coverage problem that exists throughout the country.

The *Public Notice* as currently proposed is severely lacking with respect to rural areas where drive tests will be crucial in determining coverage. It is the experience of VTDPS that thousands of miles of highways lack access to even voice service, much less mobile data, and given the vast areas subject to coverage testing, drive testing must play a larger role in the challenge process than currently proposed. The *Public Notice* as currently written renders drive testing nearly impossible to successfully complete. Further, potential exclusion of mobile voice service from the data collection process presents serious risk of absolving mobile service providers from producing quality coverage maps, which in turn will put at risk the Commission's compliance with the Broadband DATA Act.

It is the position of VTDPS that in order for the Commission to have success in this mapping exercise and comply with the Broadband DATA Act, certain proposals in the *Public Notice* must be amended to provide for a meaningful challenge process for stationary and drive testing alike, and that both voice and broadband data must come into the fold. It is the hope of

³ See *Mobile Wireless in Vermont*, Vermont Department of Public Service, available at https://publicservice.vermont.gov/sites/dps/files/documents/Mobile%20Wireless%20Coverage%20in%20VT_Jan%202019.pdf (Jan. 15, 2019).

VTDPs that the recommendations herein will further assist the Commission to bridge the digital divide, comply with the Broadband DATA Act and assure against cost prohibitive and administratively burdensome practices, all of which is in the public interest.

II. Mobile Service Challenge Process

a. Network Technology

The *Public Notice* proposes to compare each speed test against the relevant coverage map.⁴ Specifically, it proposes to compare speed tests for a particular network technology to the coverage maps for the corresponding technology, to compare the environment of the speed test (stationary or in-vehicle mobile) to the coverage map of the corresponding modeled environment and to treat as invalid and exclude any speed tests that fall outside the boundaries of the provider's most recent coverage data for the relevant technology and modeled environment.⁵

As proposed, this comparison model is problematic and should not be adopted. Currently, the choice of technology for any given speed test is almost entirely controlled by the provider. Consumers therefore have extremely limited ability to influence the technology of a test, which is limited to choosing a device that does not support either newer or older technologies. Rather, the choice of technology is determined by the network operator where the network directs a device to the specific technology to employ. What type of technology is selected depends on multiple factors such as network load, signal level and the technology supported by a device. More specifically, a network will direct a device to use the optimum technology for the environment and will often instruct it to "fall back" to earlier technology when a signal level deteriorates.

For example, in one area there may be sufficient signal quality to employ 4G LTE

⁴ *Public Notice* ¶ 9.

⁵ *Id.*

technology, but when a user moves a few feet, the signal quality may deteriorate, which then causes the network to instruct the device to “fall back” to 4G or 3G technology. This could hypothetically result in three separate test results for the same area reporting different technologies: one reporting 4G LTE, one reporting 4G and one reporting 3G.

Should all three locations be reported by a mobile service provider as within its 4G LTE coverage area, under the current proposal, the only test that would be preserved is that which reported 4G LTE technology. This will defeat the entire purpose of the challenge process, which is to report a true showing of coverage in any one area at various times and under various conditions. It is for this reason VTDPs recommends that all test types be preserved regardless of whether they fall outside the boundaries of the provider’s most recent coverage data for the relevant technology and modeled environment.

b. Voice Coverage Challenges

The *Public Notice* proposes to prohibit challenges to the voice coverage maps submitted by mobile providers because the Commission does not believe there is a reliable way to evaluate mobile voice coverage using the speed test data it requires for submitting challenges.⁶ VTDPs opposes this proposal. Despite the Commission’s conclusions to the contrary, there are at least three parameters in proposed speed test results specifications that would be definitively indicative of whether voice coverage is present: signal level, upload speed and download speed. For example, should these values be zero in a speed test, that would be indicative of there being no voice service. Or, should these figures be higher than zero but still minimal – for instance, 256 kbps download, 64 kbps upload or a signal level of less than 105 dBm – that would indicate that service is likely insufficient to sustain a voice signal.⁷ VTDPs therefore proposes that an

⁶ *Id.*

⁷ While these are just examples, providers can likely determine an appropriate threshold for what encompasses lack

alternative to no testing of mobile voice coverage at all is to determine a threshold signal level of upload speed and download speed that would be indicative of no mobile voice service.

c. H3 Geospatial Indexing System

VTDPS supports the proposed use of the H3 geospatial indexing system with certain necessary additions.⁸ VTDPS recognizes that H3 is advantageous because it is open source. However, it is far from intuitive to use, and even experienced GIS professionals will struggle to create GIS representations of the polygons. Production of a uniform set of polygons is necessary for consumers and governmental entities alike to adequately prepare for a challenge. VTDPS is also concerned that the size of resolution 8 hexagons in the northern United States is misaligned with the average sizes listed. Therefore, in addition to utilizing H3, VTDPS proposes that the Commission should also create and share GIS layers for the H3 hexagons at all resolutions it intends to employ in the coverage analysis.

d. Geographic and Testing Thresholds

The *Public Notice* proposes to require at least four child hexagons within the resolution 8 hexagon include two or more tests taken within each point-hex, and that at least one of the tests in each point-hex be negative in order to demonstrate inadequate coverage at multiple locations within the resolution 8 hexagon.⁹ For the testing threshold, the *Public Notice* calls for at least five negative tests within a resolution 8 hexagon when 20 or fewer total challenge tests have been submitted within the hexagon. VTDPS understands this requirement to call for a test sequence with three component tests all to be conducted within a single hexagon.

The *Public Notice* calls for a minimum test length of five seconds and a maximum test

of voice service.

⁸ *Public Notice* ¶ 10

⁹ *Id.* ¶ 12.

length of 30 seconds.¹⁰ It is unclear, however, whether this refers to the length of a complete test sequence of the length of each of the three individual component test metrics (upload, download and latency). VTDPs thus asks the Commission to clarify this point. Further, because tests with differing lengths of time can produce different results, VTDPs urges the Commission to standardize test length to ensure greater data uniformity.

Test duration is a balance between precision and accuracy; longer tests more accurately demonstrate service quality while shorter tests allow for more precise demonstration of location. Completion of a full test sequence in five seconds would allow just 1.6 seconds for each of the three component test metrics. The initiation of each individual upload or download test takes a portion of this time due to the handshake processes inherent in the various data communications protocols involved before any data is actually transmitted. In VTDPs experience, tests of this short duration vary significantly with network fluctuations and thus inconsistently demonstrate service quality. It is for these reasons we recommend that the Commission specify a test sequence of 15 seconds duration with five seconds for each of the individual component metric tests (upload, download, and latency).

The proposed geographic testing threshold requirements are problematic because requiring five negative tests within a resolution 8 hexagon to create a challenge will effectively make it impossible to complete sufficient tests within a resolution 8 hexagon at a reasonable speed, which will preclude the use of a drive test to create the challenge. It is the experience of VTDPs that a pause of at least five seconds is required between tests, so each complete test sequence will require at least 20 seconds.¹¹ Because resolution 8 hexagons have a width of approximately 1,100 meters at the widest point and in order to conduct five tests

¹⁰ *Id.* ¶ 14.

¹¹ It bears noting that timeframe is only applicable to apps that employ tests to a stationary IP address; apps that must look up the IP address of the test server will take longer to perform each test sequence.

within 1,100 meters, tests may be no more than 220 meters apart. To traverse 220 meters over 20 seconds, one must travel at a speed of less than 10 meters per second, the equivalent of 22.4 miles per hour. Therefore, a vehicle would have to travel at less than 25 miles per hour on a road – including highways – to meet this requirement. Further, it is impossible to traverse a resolution 8 hexagon through its widest part, which would effectively force a vehicle to travel even slower than 25 miles per hour, all of which is impractical and unsafe.

A similar problem is present for requiring tests within four of the seven resolution 9 point-hex hexagons nested within a resolution 8 hexagon to register a challenge.¹² Given that each test will require at least 20 seconds and resolution 9 hexagons have a maximum width of approximately 450 meters, a vehicle could theoretically cover 450 meters in 20 seconds at a speed of 22.5 meters per second, the equivalent of 50 miles per hour. However, this would only be possible when traversing a resolution 9 hexagon through its widest section, which is essentially impossible.

VTDPs therefore proposes that in order to demonstrate inadequate coverage at multiple locations within a resolution 8 hexagon, a single test – or, in the alternative, a maximum of two tests – be required. Further, VTDPs proposes to completely do away with the requirement for tests within four individual resolution 9 hexagons in order to challenge a resolution 8 hexagon. Both approaches will have the practical effect of ensuring that drive testing is feasible in demonstrating coverage or lack thereof.

e. Temporal Threshold

The *Public Notice* proposes to require for the temporal threshold at least two negative tests be conducted at different times of day, separated by at least four hours, to demonstrate

¹² *Id.*, FN 31.

persistent inadequate coverage.¹³ VTDPS acknowledges that this would ostensibly address the situation of a temporary network outage, but it is not a reasonable solution because it excessively complicates the already incredibly difficult task of a drive test by requiring that all roads be driven twice. Such testing will be extremely difficult, cost prohibitive and a drain on administrative resources for challenging governmental entities (never mind the average consumer) to achieve on a large scale, especially in rural areas.

Moreover, the proposed temporal threshold calls for tests to be separated by four hours. Although VTDPS understands the need for reliable challenge data, requiring challengers to engage in a complex analysis that includes the planning of drive routes to ensure that two drive tests are conducted on each road at different time blocks puts far too much onus on the challenge process and will ensure that challenges are impossible to conduct on a large scale. VTDPS proposes that a better and more effective methodology would be to allow a provider to refute a challenge by submitting evidence of a network outage in the area. Such evidence should be previously generated and reported and specific in time and location (for example applying to a specific tower, zip code or town, not a state or county).

f. Evaluating challenges against stationary and in-vehicle mobile maps

VTDPS acknowledges the Broadband DATA Act's requirement that the Commission develop a user-friendly challenge process and therefore recognizes the reasoning behind keeping two sets of coverage data and related challenge data for stationary versus mobile environments. That said, VTDPS urges the Commission to allow for challengers to submit in-motion tests to challenge stationary coverage. On a practical level, applying in-motion tests to stationary coverage data is advantageous for rural areas in particular (i.e. the majority of the United States),

¹³ *Public Notice* ¶ 12.

where consumers are in their cars driving long distances on a daily basis. Comparing in-motion tests against asserted stationary coverage would only enhance the accuracy of challenge data.

Further, it is the experience of VTDPs that the difference in performance of stationary versus in-motion environments is minimal and application of both stationary and in-motion testing will be useful in determining whether to establish a cognizable challenge. VTDPs recommends that the various thresholds for in-motion tests be raised to account for the slight difference in performance of stationary and mobile tests. For instance, an in-motion test showing service at 4/0.768 Mbps can count as a challenge of asserted stationary service at 5/1 Mbps. Similar to voice service, there is no valid argument that an in-motion test demonstrating no upload speed, no download speed or no signal should not present a challenge for stationary service. Further, adoption of these recommendations will avoid the potential for the Commission's stationary coverage map, rendered impervious to drive test challenges, to become the *de facto* primary map used by consumers and employed by Congress for funding decisions, and most importantly, it will ultimately ensure more accurate mapping.

g. Test Location Reporting

The *Public Notice* proposes a laundry list of on-the-ground challenge test data metrics for submitting a challenge for any one hexagon.¹⁴ It is the understanding of VTDPs that a single test sequence includes three component test metrics (upload, download and latency) and that test results must include a start and stop coordinate point for each test metric. It is also the understanding of VTDPs that where tests are in motion, the location of each test will be the midpoint between its start and stop points, all of which equates to six sets of coordinates for each

¹⁴ *Id.* ¶ 14.

test sequence within a single hexagon.¹⁵

These requirements are problematic for two reasons. First, requiring any one test sequence to have such excessive data will require unreasonable processing to produce and record an exorbitant number of coordinates in any of the proposed app options,¹⁶ which in turn will result in significant extra data and exponential possibility for data errors. It will be administratively burdensome on government entities in particular, with their own speed test apps, to subsequently adapt those apps to include six sets of coordinates for each test sequence.

Second, as demonstrated herein, since the length of road traversed during a test is significant, it is very likely that the road segment will overlap hexagon boundaries. In other words, as the resolution of a hexagon increases, the likelihood that each test will overlap hexagon boundaries also increases. In order to avoid such geographic overlap, VTDPs recommends that in lieu of requiring challengers to report geographic coordinates measured at the start and end of each test metric,¹⁷ a single set of coordinates at the start of the test sequence be required. Further, in order to limit any geographic overlap between hexagons for in-motion tests, test length should be limited to 20 seconds instead of the proposed 30 seconds.¹⁸

An alternative to the above recommendation is to require two sets of coordinates: one at the start of each test sequence and another at the end of each complete test sequence – which would allow the Commission to subsequently calculate the midpoint of each test sequence. Regardless, because there is great risk for error and overlap, not to mention the administrative burden that such excessive data reporting puts on challengers, it is in the public interest to eliminate the requirement to complete a challenge test sequence within each hexagon

¹⁵ See *Id.* FN 27 (“In the case where a test reports more than one pair of distinct geographic coordinates (e.g., because the device was in motion), we propose to associate the test with the midpoint of the reported coordinates.”).

¹⁶ *Id.* ¶ 14.

¹⁷ *Id.*

¹⁸ *Id.*

and instead have just a single location for each test sequence.

h. Carrier Support

The *Public Notice* specifies the method through which challengers must assess a challenge¹⁹ and the type of device on which speed tests must be conducted.²⁰ There is no mention, however, of the additional cost that will be imposed upon challengers in obtaining provider-approved devices, which has the potential to prohibit challengers from conducting a challenge at all. In order for government entities in particular to obtain provider-approved devices to conduct a challenge, it will require upwards of \$1,000 for each device. Because the challenge process will require testing the coverage of at least four mobile service providers in most areas, it will cost approximately \$4,000 to simply obtain the appropriate device for a test, never mind the cost involved to complete the testing itself. This cost is unreasonable and should not be the sole responsibility of challengers to bear.

Notably, it is straightforward to obtain prepaid service, as it does not require a credit check. Further, the existence of coverage is demonstrably different for post-paid service versus pre-paid service since the latter often excludes roaming in rural areas. This presents a tangible risk that tests in rural areas will be inaccurate if pre-paid service is employed. Further, the majority of mobile service providers require a credit check using an individual's Social Security Number or tax identification number to initiate post-paid service. This presents an unreasonable imposition on challengers, especially government entities that lack tax identification numbers and thus would be compelled to use their employee's personal information to obtain devices and

¹⁹ *Id.* (stating that for government and third-party entity challengers, challenge data is permitted to be collected using software and hardware other than FCC developed or approved apps).

²⁰ *Public Notice*, Appendix B p. 57 (“Challengers must conduct speed tests using a device advertised by the challenged service provider as compatible with its network and must take all speed tests outdoors. Challengers must also use a device that is engineering-capable and able to interface with drive test software and/or runs on the Android operating system.”).

service.

VTDPS therefore strongly urges the Commission to require all mobile service providers to temporarily provide their approved devices to governmental entities wishing to engage in a challenge either free of or at a reduced cost. Specifically, VTDPS recommends that, upon request of the respective Public Utility Commission for a state, mobile service providers issue to governmental entities up to two handsets with post-paid service. VTDPS also recommends that mobile service providers designate a single office to work with states to process the requests of government entities for provider-approved devices for challenges.

III. CONCLUSION

Adoption of a voice testing component in addition to enhanced models for drive testing is crucial to the success of the Digital Opportunity Data Collection. To uphold the integrity of all verification and challenge data, the approach toward data testing in rural areas must be improved. Finally, the burden put upon all challengers – individual consumers and government entities alike – must be further considered in order to ensure compliance with the Broadband DATA Act.

Respectfully submitted,

By: /s/ Sarah L. J. Aceves
Sarah L. J. Aceves, Special Counsel
O: (802) 828-3167
C: (202) 423-3363
sarah.aceves@vermont.gov

September 10, 2021